CLAIMS

What is claimed is:

1. An electrochemical energy storage device, comprising:

a plurality of cells in series, said plurality of cells being electrically connected via a plurality of bi-polar current collectors and wherein said plurality of cells and said plurality of bi-polar current collectors are stacked to form an assembly; and

a pre-formed metal sheet outer casing electrically connected to said assembly and serving as an external electrical contact.

2. An electrochemical energy storage device as in claim 1, wherein said plurality of cells comprise at least one of a double-layer capacitor, a pseudo-capacitor, a battery or a combination thereof.

3. An electrochemical energy storage device as in claim 1, wherein said pre-formed metal sheet outer casing comprises two shells, each shell including side portions opposing each other to form an open-ended outer covering for said assembly, and wherein said side portions overlap each other and are joined together.

4. An electrochemical energy storage device as in claim 3, wherein said shells are U-shaped and form a box-shaped outer casing.

5. An electrochemical energy storage device as in claim 3, wherein said outer casing is joined at each of said overlapping side portions by welding.

6. An electrochemical energy storage device as in claim 3, wherein said pre-formed metal sheet is stainless steel.

7. An electrochemical energy storage device as in claim 6, wherein said outer casing is cleaned of any oxidation products and coated with a highly conductive metal.

8. An electrochemical energy storage device as in claim 7, wherein said highly conductive metal is gold.

9. An electrochemical energy storage device as in claim 3, wherein said outer casing is partially bowed to impart a spring loading thereto.

10. An electrochemical energy storage device as in claim 2, wherein said pre-formed metal sheet outer casing is a single sheet folded at least once approximate its midpoint and at least once at each end to form side portions, and wherein said side portions oppose each other to form an open-ended outer covering for said assembly, and wherein said side portions overlap each other and are joined together.

11. An electrochemical energy storage device as in claim 10, wherein said outer casing is joined at each of said overlapping side portions by welding.

12. An electrochemical energy storage device as in claim 10, wherein said pre-formed metal sheet is stainless steel.

13. An electrochemical energy storage device as in claim 12, wherein said outer casing is cleaned of any oxidation products and coated with a highly conductive metal.

14. An electrochemical energy storage device as in claim 13, wherein said highly conductive metal is gold.

15. An electrochemical energy storage device as in claim 10, wherein said outer casing is partially bowed to impart a spring loading thereto.

16. An electrochemical energy storage device as in claim 2, wherein said pre-formed metal sheet outer casing is a tube.

17. An electrochemical energy storage device as in claim 16, wherein said pre-formed metal sheet is stainless steel.

18. An electrochemical energy storage device as in claim 17, wherein said outer casing is cleaned of any oxidation products and coated with a highly conductive metal.

19. An electrochemical energy storage device as in claim 18, wherein said highly conductive metal is gold.

20. An electrochemical energy storage device as in claim 16, wherein said outer casing is partially bowed to impart a spring loading thereto.

21. A method of forming an electrochemical energy storage device, comprising the steps of:

providing a plurality of cells in series, said plurality of cells being electrically connected via a plurality of bi-polar current collectors and wherein said plurality of cells;

stacking said plurality of bi-polar current collector connected cells to form an assembly; and

providing a pre-formed metal sheet outer casing for said assembly and electrically connected to said assembly, and wherein said outer casing serves as an external electrical contact.

22. A method of forming an electrochemical energy storage device as in claim 21, wherein said plurality of cells comprise at least one of a double-layer capacitor, a pseudo-capacitor, a battery or a combination thereof.

23. A method of forming an electrochemical energy storage device as in claim 22, wherein said pre-formed metal sheet outer casing comprises two shells, each shell including side portions opposing each other to form an open-ended outer covering for said assembly, and wherein said side portions overlap each other and are joined together.

24. A method of forming an electrochemical energy storage device as in claim 23, wherein said shells are U-shaped and form a box-shaped outer casing.

25. A method of forming an electrochemical energy storage device as in claim 23, wherein said outer casing is joined at each of said overlapping side portions by welding.

26. A method of forming an electrochemical energy storage device as in claim 23, wherein said pre-formed metal sheet is stainless steel.

27. A method of forming an electrochemical energy storage device as in claim 26, wherein said outer casing is cleaned of any oxidation products and coated

with a highly conductive metal.

28. A method of forming an electrochemical energy storage device as in claim 27, wherein said highly conductive metal is gold.

29. A method of forming an electrochemical energy storage device as in claim 23, wherein said outer casing is partially bowed to impart a spring loading thereto.

30. A method of forming an electrochemical energy storage device as in claim 21, wherein said pre-formed metal sheet outer casing is a single sheet folded at least once approximate its midpoint and at least once at each end to form side portions, and wherein said side portions oppose each other to form an open-ended outer covering for said assembly, and wherein said side portions overlap each other and are joined together.

31. A method of forming an electrochemical energy storage device as in claim 30, wherein said outer casing is joined at each of said overlapping side portions by welding.

32. A method of forming an electrochemical energy storage device as in claim 30, wherein said pre-formed metal sheet is stainless steel.

33. A method of forming an electrochemical energy storage device as in claim 32, wherein said outer casing is cleaned of any oxidation products and coated with a highly conductive metal.

34. A method of forming an electrochemical energy storage device as in claim 33, wherein said highly conductive metal is gold.

35. A method of forming an electrochemical energy storage device as in claim 30, wherein said outer casing is partially bowed to impart a spring loading thereto.

36. A method of forming an electrochemical energy storage device as in claim 22, wherein said pre-formed metal sheet outer casing is a tube.

37. A method of forming an electrochemical energy storage device as in claim 36, wherein said pre-formed metal sheet is stainless steel.

38. A method of forming an electrochemical energy storage device as in claim 37, wherein said outer casing is cleaned of any oxidation products and coated with a highly conductive metal.

39. A method of forming an electrochemical energy storage device as in claim 38, wherein said highly conductive metal is gold.

40. A method of forming an electrochemical energy storage device as in claim 36, wherein said outer casing is partially bowed to impart a spring loading thereto.

41. An electrochemical energy storage device, comprising:

a capacitor and a battery in parallel, said capacitor and battery being electrically connected to a bi-polar current collector;

a pre-formed metal sheet outer casing electrically connected to said capacitor and battery and serving as an external contact.

42. An electrochemical energy storage device as in claim 41, wherein said pre-formed metal sheet outer casing comprises two shells, each shell including side portions opposing each other to form an open-ended outer covering for said assembly, and wherein said side portions overlap each other and are joined together.

43. An electrochemical energy storage device as in claim 42, wherein said shells are U-shaped and form a box-shaped outer casing.

44. An electrochemical energy storage device as in claim 42, wherein said outer casing is joined at each of said overlapping side portions by welding.

45. An electrochemical energy storage device as in claim 42, wherein said pre-formed metal sheet is stainless steel.

46. An electrochemical energy storage device as in claim 45, wherein said outer casing is cleaned of any oxidation products and coated with a highly conductive metal.

47. An electrochemical energy storage device as in claim 46, wherein said highly conductive metal is gold.

48. An electrochemical energy storage device as in claim 42, wherein said outer casing is partially bowed to impart a spring loading thereto.

49. An electrochemical energy storage device as in claim 41, wherein said pre-formed metal sheet outer casing is a single sheet folded at least once approximate its midpoint and at least once at each end to form side portions, and wherein said side portions oppose each other to form an open-ended outer covering for said assembly, and wherein said side portions overlap each other and are joined together.

50. An electrochemical energy storage device as in claim 49, wherein said outer casing is joined at each of said overlapping side portions by welding.

51. An electrochemical energy storage device as in claim 49, wherein said pre-formed metal sheet is stainless steel.

52. An electrochemical energy storage device as in claim 51, wherein said outer casing is cleaned of any oxidation products and coated with a highly conductive metal.

53. An electrochemical energy storage device as in claim 52, wherein said highly conductive metal is gold.

54. An electrochemical energy storage device as in claim 49, wherein said outer casing is partially bowed to impart a spring loading thereto.

55. An electrochemical energy storage device as in claim 41, wherein said pre-formed metal sheet outer casing is a tube.

56. An electrochemical energy storage device as in claim 55, wherein said pre-formed metal sheet is stainless steel.

57. An electrochemical energy storage device as in claim 56, wherein said outer casing is cleaned of any oxidation products and coated with a highly conductive metal.

58. An electrochemical energy storage device as in claim 57, wherein said highly conductive metal is gold.

59. An electrochemical energy storage device as in claim 55, wherein said outer casing is partially bowed to impart a spring loading thereto.